

## CLAIMS

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1. A multi-printer system comprising:  
a plurality of imaging apparatus, each said apparatus comprising at least one liquid-toner reservoir, containing liquid toner;  
a central source of toner concentrate;  
a toner concentrate conduit which connects the central source to the individual imaging apparatus; and  
at least one toner-concentrate pump which pumps the toner concentrate from the central source to the individual imaging apparatus.
2. A system according to claim 1 in which the imaging apparatus each comprise:  
a toner-concentrate dispenser which dispenses toner concentrate to said liquid-toner reservoir,  
wherein the toner concentrate conduit connects the central source to the toner concentrate dispenser, such that toner concentrate is transferred from the central source to the toner concentrate dispenser via the toner concentrate conduit.
3. A system according to claim 2 and comprising at least one controller.
4. A system according to claim 3, wherein:  
the toner concentrate dispenser comprises a dispenser can; and  
the can dispenses toner concentrate into the reservoir in response to a command from the at least one controller.
5. A system according to claim 3 or 4 wherein:  
the central source of toner concentrate comprises a central container of toner concentrate, containing a concentrate of the same color as a liquid-toner contained in a liquid-toner reservoir of the imaging apparatus; and  
the toner concentrate conduit is a branching feed line comprising:  
a junction having an input port and a plurality of output ports;  
a line connecting the source with the input port; and  
a plurality of lines, each connecting one of the output ports with a different one of the imaging apparatus.
- Sub  
B2

PDV A01

6. A system according to claim 5 wherein a toner-concentrate pump is located on each line connecting the source with an input port.

7. A system according to claim 6 wherein the toner-concentrate pump operates continuously.

8. A system according to any of the claims 3-7 wherein the at least one toner-concentrate pump comprises a high-viscosity pump.

9. A system according to any of claims 3-8 wherein the imaging apparatus are multi-colored and comprising a plurality of central sources of toner concentrate, each having a different color of toner concentrate.

10. A system according to claim 9 wherein the plurality of liquid-toner reservoirs comprises liquid-toner reservoirs of at least yellow, magenta and cyan toner.

11. A system according to any of claims 3-10 wherein each liquid-toner reservoir comprises a particle density measurement device that measures a quantity related to the density of toner particles in the liquid toner and sends the measurements to the at least one controller and wherein the at least one controller transfers toner concentrate to the liquid toner reservoir responsive to the measurements.

12. A system according to any of claims 3-11 wherein:  
each of the printing apparatus includes:

a carrier-liquid reservoir from which carrier liquid is supplied to the liquid-toner reservoir; and

at least one local carrier liquid conduit through which carrier liquid is supplied to the liquid-toner reservoir, responsive to commands from the at least one controller; and

the system includes:

a central source of carrier liquid; and

a central carrier liquid conduit which carries the carrier liquid to individual ones of the carrier liquid reservoirs responsive to commands from the at least one controller.

PDV A01

13. A multi-printer system comprising:  
a plurality of imaging apparatus,  
a central source of carrier liquid;  
at least one controller;

5 a central carrier-liquid conduit which connects the central source of carrier liquid to each of the imaging apparatus and carries carrier liquid to the individual apparatus responsive to a command from the at least one controller.

10 14. A system according to claim 13 and including a carrier-liquid exhaust line which collects discharged carrier liquid from the imaging apparatus and returns it to the central source of carrier liquid.

15 15. A system according to claim 13 wherein each said imaging apparatus comprises a liquid-toner reservoir.

16. A system according to claim 15 wherein the imaging apparatus includes:  
a carrier-liquid reservoir from which carrier liquid is supplied to the liquid-toner reservoir,  
wherein the central carrier liquid conduit carries the carrier liquid to individual ones of  
20 the carrier liquid reservoirs responsive to commands from the at least one controller.

25 17. A system according to any of claims 12, 15 or 16 wherein the central carrier-liquid conduit comprises a branching carrier-liquid feed line, comprising:  
a proximal end at the central source of carrier liquid; and  
distal ends at the imaging apparatus.

30 18. A system according to claim 17 wherein:  
the branching carrier-liquid feed line comprises valves at its distal ends; and  
the valves are controlled by the at least one controller.

19. A system according to claim 17 or claim 18 wherein:  
the carrier-liquid conduit comprises a pump; and  
the pump is controlled by the at least one controller.

PDV A01

Sub. 86  
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20. A system according to any of claims 12 or 15-19 wherein:  
each carrier-liquid reservoir comprises a carrier-liquid level indicator; and  
measurements of the carrier-liquid level indicator are sent to the at least one  
controller.

5 21. A system according to any of claims 12 or 15-20 wherein each imaging apparatus  
comprises a conductivity measurement device that measures the conductivity of liquid toner  
in the liquid toner reservoir; and including:

10 a source of charge director solution; and  
at least one charge director solution conduit that communicates between the source of  
charge director solution and the at least one carrier liquid conduit, wherein a quantity of  
charge director solution is sent to the reservoir responsive to a low conductivity measurement.

22. A printer system comprising:

15 at least one liquid toner reservoir, each said reservoir including a first detector that  
provides a first signal when the amount of liquid toner therein falls below a given volume and  
a second detector that measures the conductivity of the liquid toner and produces a second  
signal responsive thereto;

20 a source of carrier liquid;  
a source of charge director solution;  
at least one controller;

at least one carrier liquid conduit that communicates between the source of carrier  
liquid and the at least one liquid toner reservoir;

25 at least one charge director solution conduit that communicates between the source of  
charge director solution and the at least one carrier liquid conduit,

wherein the controller is operative to transfer a first quantity of carrier liquid to a  
liquid toner reservoir via the charge director conduit when the first signal associated with the  
reservoir indicates a low volume condition for the reservoir and is operative to send a second  
quantity of charge director solution to the reservoir via the charge-director and carrier-liquid  
30 conduits, responsive to the second signal associated with the reservoir indicating a low  
conductivity condition.

Sub. 87  
Completed

23. A system according to claim 21 or claim 22 wherein, in transferring the charge  
director to the reservoir, the controller is operative to transfer the quantity of charge director

PDV A02

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solution to a local carrier liquid conduit from which it is carried by a subsequent transfer of carrier liquid to the reservoir.

24. A system according to claim 23 wherein the controller is operative to send the charge director solution to the local carrier liquid conduit immediately prior to sending carrier liquid to the reservoir such that the carrier liquid carries the charge director into the reservoir.

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25. A system according to any of claims 21-24 wherein the quantity of charge director solution sent to the liquid toner reservoir is substantially less than the quantity of carrier liquid sent to the reservoir.

26. A system according to claim 25 wherein the charge director conduit joins the carrier liquid conduit near an entrance to the reservoir from the carrier liquid conduit.

27. A multi-printer system comprising:  
a plurality of imaging apparatus, each said apparatus comprising:  
a printing engine  
a liquid-toner inlet line from which fresh liquid toner is fed to the printing engine;  
a central source of liquid toner;  
a liquid-toner feed which connects the central source to the liquid-toner inlet line;  
at least one controller which transfers fresh liquid toner from the central source, via said feed.

28. A system according to claim 27 wherein each imaging apparatus includes:  
a liquid-toner exhaust line which collects discharged liquid toner from the printing engine and delivers it to the central source.

29. A system according to claim 28 wherein the liquid-toner feed is a branching feed line comprising:

a junction;

a first feed line connecting the central source with the junction; and

a plurality of second feed lines connecting the junction with respective liquid-toner inlet lines of the imaging apparatus.

PDV A01

30. A system according to claim 29 wherein:  
each of said plurality of feed lines includes a valve controlled by the at least one controller.

31. A system according to any of claims 27-30 wherein:  
the imaging apparatus are multi-colored; and  
a liquid-toner inlet line comprises a plurality of liquid-toner inlet lines.

32. A system according to any of claims 27-31 wherein the central source of liquid toner is multi-colored, comprising a plurality of central containers of liquid toner of different colors.

33. A system according to claim 32 wherein the plurality of liquid-toner containers comprises liquid-toner containers of at least yellow, magenta and cyan toner.

34. A system according to any of claims 27-33 and including:  
a central source of carrier liquid; and  
a carrier liquid conduit that connects the central source to the individual imaging apparatus,  
wherein the at least one controller is operative to transfer carrier liquid from the central source of carrier liquid to the individual imaging apparatus as required by the apparatus for cleaning.

35. A system according to claim 34 and including a carrier-liquid pump that pumps carrier-liquid to respective imaging apparatus responsive to commands from said at least one controller.

36. A system according to claim 34 or claim 35 and including a carrier liquid return conduit that collects carrier liquid after use by the imaging device and transfers it to the central source of carrier liquid.

37. A system according to claim 36 and including a separator that removes toner particles from the collected carrier liquid prior to its delivery to the central source of carrier liquid.

PDV A01

38. A system according to any of the preceding claims wherein the imaging apparatus comprise electrostatographic imaging apparatus.

5 39. A system according to any of the preceding claims wherein the imaging apparatus comprise electrophotographic apparatus.

40. A system according to any of the preceding claims wherein the imaging apparatus comprise printers.

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41. A system according to any of the preceding claims wherein the imaging apparatus comprise copiers.

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42. A method of dispensing toner concentrate in a multi-printer facility comprising a plurality of imaging apparatus, each said apparatus comprising a liquid toner reservoir, the method comprising:

providing a central source of toner concentrate; and

automatically transferring toner concentrate from said central source to individual imaging apparatus.

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43. A method according to claim 42 wherein transferring comprises transferring toner concentrate directly to a liquid-toner reservoir of the individual imaging apparatus, in response to a deficiency of toner concentrate in the reservoir.

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44. A method according to claim 42 wherein transferring comprises transferring toner concentrate to a liquid-toner concentrate dispenser associated with a liquid-toner reservoir in the individual imaging apparatus.

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45. A method of providing liquid toner in a multi-printer facility comprising a plurality of imaging apparatus, comprising:

providing a central source of liquid toner; and

automatically transferring liquid toner from said central source to individual imaging apparatus in response to a need of liquid toner in said imaging apparatus.

PDV A01

46. A method of providing carrier liquid in a multi-printer facility comprising a plurality of imaging apparatus, comprising:

providing a central source of carrier liquid; and

5 automatically transferring carrier liquid from said central source to individual imaging apparatus in response to a need of carrier liquid in said imaging apparatus.

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